

## Claims

What is claimed is:

- 1     1. An electrical structure, comprising:  
2             contact pads on a surface of a substrate, wherein the contact pads are adapted to couple  
3     signal, power, and ground connections for an electrical device to a plurality of conductive wires  
4     on the substrate, wherein the contact pads are formed in single lines along radial edges of sectors  
5     on the substrate, wherein each sector comprises a predetermined angle between the radial edges  
6     of each of said sectors, wherein the sectors collectively form a circular area, and wherein the  
7     contact pads comprise signal, power, and ground connections located at predetermined positions  
8     on the single lines along the radial edges of each of said sectors.
  
- 1     2. The electrical structure of claim 1, wherein the plurality of conductive wires on the substrate  
2     are positioned between the radial edges of the sectors on the substrate.
  
- 1     3. The electrical structure of claim 2, wherein each predetermined angle is based on a number of  
2     conductive wires positioned between the radial edges of each sector, a width of each of said  
3     conductive wires, and a space required between adjacent wires of said conductive wires.
  
- 1     4. The electrical structure of claim 1, wherein said contact pads are adapted for solder bump,

2 solder ball, or controlled collapse chip connection attachment to a flip-chip mounted chip.

1 5. The electrical structure of claim 1, wherein said substrate is selected from the group consisting  
2 of a single wiring layer or multi-layer wiring layer integrated circuit chip module, a single wiring  
3 layer or multi-layer wiring layer printed circuit board, a single wiring layer or multi-layer wiring  
4 layer flexible circuit board, a single wiring layer or multi-layer wiring layer interposer, a single  
5 wiring layer or multi-layer wiring layer ceramic substrate, a single wiring layer or multi-layer  
6 wiring layer organic substrate.

1 6. The electrical structure of claim 1, wherein said substrate comprises layers, wherein the  
2 contact pads are on a first layer, wherein said substrate further comprises at least one reference  
3 mesh plane, wherein the at least one reference mesh plane is on a second layer, wherein the at  
4 least one reference mesh plane comprises a first group of conductors and a second group of  
5 conductors, wherein the first group of conductors are formed in a first pattern comprising a  
6 concentric circles, wherein the second group of conductors are formed in a second pattern  
7 comprising single lines lying on radii of said concentric circles, and wherein the first group of  
8 conductors are electrically connected to the second group of conductors thereby forming a two-  
9 dimensional conductive grid.

1 7. The electrical structure of claim 1, wherein said substrate further comprises layers, wherein at  
2 least one metal reference plane is located between successive layers of the substrate, wherein at

least one metal reference plane comprises vent holes adapted to vent gasses generated during fabrication of the substrate, wherein the vent holes comprise a pattern such that the vent holes are formed in single lines along radial edges of sector on the substrate, wherein each of the sectors comprise a predetermined angle between the radial edges of each of said sectors, wherein the sectors collectively form a circular area, and wherein the plurality of conductive wires on the substrate do not pass over or under any of the vent holes.

1 8. An electrical structure, comprising:

2 first contact pads on a surface of a substrate, wherein the first contact pads are adapted to  
3 couple signal, power, and ground connections for an electrical device to a first plurality of  
4 conductive wires on the substrate, wherein the first contact pads are formed in single lines along  
5 radial edges of sectors on the substrate, wherein each of the sectors comprise a predetermined  
6 angle between the radial edges of each of said sectors, wherein the sectors collectively form a  
7 quadrant in each corner of said substrate, and wherein the first contact pads comprise said signal,  
8 power, and ground connections located at predetermined positions on the single lines along the  
9 radial edges of the sectors within each quadrant; and

10 second contact pads on the surface of a substrate, wherein the second contact pads are  
11 adapted to couple signal, power, and ground connections for said electrical device to a second  
12 plurality of conductive wires on the substrate, wherein the second contacts pads are spaced apart  
13 a first predetermined distance in a first direction, wherein the second contact pads are spaced  
14 apart a second predetermined distance in a second direction, wherein first predetermined distance  
15 is different from said second predetermined distance, wherein the first direction is perpendicular  
16 to the second direction, and wherein the first and second contact pads are located on different  
17 areas on the substrate.

1 9. The electrical structure of claim 8, wherein the first plurality of conductive wires are  
2 positioned between the radial edges of the sectors, and wherein the second plurality of  
3 conductive wires are positioned between adjacent contact pads in said first direction.

1 10. The electrical structure of claim 9, wherein each predetermined angle is based on a number  
2 of conductive wires positioned between the radial edges of the sectors, a width of each of said  
3 conductive wires, and a space required between each adjacent wire of said conductive wires, and  
4 wherein the first predetermined distance is based on a number of conductive wires positioned  
5 between said adjacent contact pads in said first direction, a width of each of said conductive  
6 wires, and a space required between adjacent wires of said conductive wires.

1 11. The electrical structure of claim 8, wherein the first contact pads and the second contact pads  
2 are adapted for solder bump, solder ball or controlled collapse chip connection attachment to a  
3 flip-chip mounted chip.

1 12. The electrical structure of claim 8, wherein said substrate is selected from the group  
2 consisting of a single wiring layer or multi-layer wiring layer integrated circuit chip module, a  
3 single wiring layer or multi-layer wiring layer printed circuit board, a single wiring layer or  
4 multi-layer wiring layer flexible circuit board, a single wiring layer or multi-layer wiring layer  
5 interposer, a single wiring layer or multi-layer wiring layer ceramic substrate, a single wiring  
6 layer or multi-layer wiring layer organic substrate.

1 13. The electrical structure of claim 8, wherein said substrate comprises layers, wherein the  
2 contact pads are on a first layer, wherein said substrate further comprises at least one reference  
3 mesh plane, wherein the at least one reference mesh plane is on a second layer, wherein the at

least one reference mesh plane comprises a first group of conductors and a second group of conductors, wherein the first group of conductors are formed in a first pattern comprising concentric shapes, wherein the second group of conductors are formed in a second pattern comprising a same pattern as a pattern formed by the first plurality of conductive wires and the second plurality of conductive wires, wherein the second group of conductors formed in the second pattern are offset from the first plurality of conductive wires and the second plurality of conductive wires, and wherein the first group of conductors are electrically connected to the second group of conductors thereby forming a two-dimensional conductive grid.

14. The electrical structure of claim 8, wherein said substrate comprises layers, wherein at least one metal reference plane is located between successive layers of the substrate, wherein the at least one metal reference plane comprises vent holes adapted to vent gasses generated during fabrication of the substrate, wherein the plurality of vent holes comprise a first pattern comprising a same pattern as a pattern formed by the first plurality of conductive wires and the second plurality of conductive wires, wherein the vent holes comprising the first pattern are offset from the first plurality of conductive wires and the second plurality of conductive wires, and wherein the first plurality of conductive wires and the second plurality of conductive wires on the substrate do not pass over or under any of the vent holes.

1 15. A method for forming an electrical structure, comprising:

2 forming contact pads on a surface of a substrate, wherein the contact pads are adapted to  
3 couple signal, power, and ground connections for an electrical device to a plurality of conductive  
4 wires on the substrate, wherein the contact pads are formed in single lines along radial edges of  
5 sectors on the substrate, wherein each sector comprises a predetermined angle between the radial  
6 edges of each of said sectors, wherein the sectors collectively form a circular area, and wherein  
7 the contact pads comprise signal, power, and ground connections located at predetermined  
8 positions on the single lines along the radial edges of each of said sectors.

1 16. The method of claim 15, further comprising positioning the plurality of conductive wires on  
2 the substrate between the radial edges of the sectors on the substrate.

1 17. The method of claim 15, further comprising calculating each predetermined angle based on  
2 number of conductive wires positioned between the radial edges of the sectors, a width of each of  
3 said conductive wires, and a space required between adjacent wires of said conductive wires.

1 18. The method of claim 15, wherein said substrate is selected from the group consisting of a  
2 single wiring layer or multi-layer wiring layer integrated circuit chip module, a single wiring  
3 layer or multi-layer wiring layer printed circuit board, a single wiring layer or multi-layer wiring  
4 layer flexible circuit board, a single wiring layer or multi-layer wiring layer interposer, a single  
5 wiring layer or multi-layer wiring layer ceramic substrate, a single wiring layer or multi-layer

6 wiring layer organic substrate.

1 19. The method of claim 15, further comprising forming at least one reference mesh plane on a  
2 first layer of the substrate, and

3 forming the contact pads on a second layer of the substrate, wherein the at least one  
4 reference mesh plane comprises a first group of conductors and a second group of conductors,  
5 wherein the first group of conductors are formed in a first pattern comprising concentric circles,  
6 wherein the second group of conductors are formed in a second pattern comprising single lines  
7 lying on radii of said concentric circles, and wherein the first group of conductors are electrically  
8 connected to the second group of conductors thereby forming a two-dimensional conductive grid.

1 20. The method of claim 15, further comprising forming the substrate comprising layers,  
2 wherein at least one metal reference plane is located between successive layers of the substrate,  
3 wherein at least one metal reference plane comprises vent holes adapted to vent gasses generated  
4 during fabrication of the substrate, wherein the vent holes comprise a pattern such that the vent  
5 holes are formed in single lines along radial edges of the sectors on the substrate, wherein each of  
6 the sectors comprise a predetermined angle between the radial edges of each of said sectors,  
7 wherein the sectors collectively form a circular area, and wherein the plurality of conductive  
8 wires on the substrate do not pass over or under any of the vent holes.